VOL. 18 • NO. 05
MAY 2011

MSMR

A publication of the Armed Forces Health Surveillance Center



MEDICAL SURVEILLANCE MONTHLY REPORT

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Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
MAY 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Medical Surveillance Monthly Report (MSMR). Volume 18, Number 05, May 2011	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Armed Forces Health Surveillance Center (AFHSC),11800 Tech Road, Suite 220,Silver Spring,MD,20910**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**20**	

Eye Injuries, Active Component, U.S. Armed Forces, 2000-2010

The structure of the face and eye offer natural protection against eye injury. The bony orbit and quickly closing eyelids protect the eyeball from minor impacts and harmful substances. As a result, most eye injuries spare the eyeball and are not serious. However, even minor eye injuries can result in lost duty time and reduced military operational effectiveness. More significant eye injuries can cause blindness or other permanent loss of visual function in one or both eyes. The U.S. military has aggressively countered eye injury threats, especially those related to combat; in 2004, ballistic protective eyewear became standard issue for deploying forces.

Several recent reports have reviewed the numbers and natures of eye injuries among U.S. service members.[1-3] In an effort to improve eye injury surveillance in the U.S. Armed Forces, the Tri-Service Vision Conservation and Readiness Program (TSVCRP) at the US Army Public Health Command (USAPHC) and the Armed Forces Health Surveillance Center (AFHSC) have recently developed a quarterly surveillance report designed to monitor rates and trends of eye injuries among active component service members by cause and by specific military, occupational and demographic characteristics. This article summarizes selected results from the most recent of these reports.

Methods:

The surveillance period was January 2000 to December 2010. The surveillance population included all members of the U.S. Armed Forces who served in the active component at any time during the surveillance period. Eye injury diagnoses were derived from standardized records of medical encounters that occurred in (a) fixed military and non-military medical facilities in the U.S. and overseas and (b) deployed military medical facilities (primarily in Iraq and Afghanistan). Eye injuries diagnosed in deployed settings were summarized for the period January 2005 to December 2010 only.

Eye injuries were defined by eye injury-specific diagnostic codes **(Table 1)** coded in any diagnostic position during a medical visit. For surveillance purposes, if an individual had the same eye injury documented in different clinical settings, diagnoses reported during hospitalizations in fixed medical facilities were prioritized over those reported during medical encounters in deployed settings which, in turn, were prioritized over diagnoses reported during outpatient encounters in fixed medical facilities.

Seventy-three eye injury-related diagnostic codes (ICD-9-CM) were separated into nine clinically relevant categories **(Table 1)**. The "high risk of blindness" category reflected the findings of a 2006 study of United States Eye Injury Registry data; in that study, injuries with the highest risk of blindness were perforating trauma (64% of such injuries caused blindness), globe rupture (60%), intraocular foreign body (25%), and penetrating trauma (23%).[4]

To estimate the number of individuals affected by "superficial injuries" of the eye, each individual could be considered an "incident case" only once per 60-day period. For all non-superficial eye injury categories, individuals could be incident cases of each type of injury only once during the surveillance period. Rates of eye injuries in fixed medical facilities were calculated as incident medical encounters per 1,000 person-years of service in the active component. Rates of injuries diagnosed in deployed settings were not calculated because of incomplete ascertainment of all medical encounters and all service time during deployments throughout the surveillance period. Finally, causes of injuries were assessed using external cause of injury codes (ICD-9-CM "E codes") for eye injuries treated in ambulatory settings and STANAG (NATO Standardization Agreement No. 2050) codes for hospitalized eye injuries.

Table 1. Defining diagnostic codes (ICD-9-CM) of nine clinical categories of eye injury

Injury category	Description	Diagnosis codes
High risk blindness[a]	Perforating/penetrating trauma, globe rupture, intraocular foreign body	871.0-871.9
Anterior segment	Hyphema, traumatic cataract	364.41, 366.22, 364.76
Burns	Chemical and thermal burns of eye/adnexa	940.0-940.5, 940.9, 941.02, 941.12, 941.22, 941.32, 941.42, 941.52
Contusion	Black eye, contusion of globe	921.0-921.3, 921.9
Lid/adnexa	Lacerations of lid and adjacent structures	870.0-870.2, 870.8-870.9
Optical/cranial nerve	Optic nerve, eye movements	950.0-950.3, 950.9, 951.0, 951.1, 951.3
Orbit	Orbital fractures and orbital penetrating wounds	802.6-802.8, 870.3-870.4, 367.32
Posterior segment	Retinal and choroidal hemorrhage, retinal detachment	362.81, 361.0, 361.00-361.07, 363.61, 363.63, 379.23, 360.00-360.01
Superficial	Abrasions and external foreign bodies	918.0-918.2, 918.9, 930.0-930.2, 930.8-930.9

[a]High risk of blindness category based on a 2006 study of United States Eye Injury Registry data.[4]

Results:

Eye injuries treated in fixed medical facilities:

During the 11-year surveillance period, there were 186,555 eye injuries diagnosed in fixed (e.g., not deployed, at sea) medical facilities. Of these, approximately 3 percent (n=4,030) required hospitalization; most by far (n=182,525) were treated during ambulatory visits only **(Table 2)**.

During the period, the overall rate of eye injury hospitalizations was 0.26 per 1,000 person-years (p-yrs). Rates of eye injury hospitalizations were stable during 2000 through 2002 (0.21 per 1,000 p-yrs), increased sharply in 2003 and 2004 (0.29 and 0.34 per 1,000 p-yrs respectively), generally declined during 2005 through 2008 (0.23 per 1,000 p-yrs) and remained stable in 2009 and 2010 **(Figure 1a)**. Rates of incident eye injury-related ambulatory visits were relatively stable throughout the period **(Figure 1b)**; the overall rate during the surveillance period was 11.65 per 1,000 p-yrs.

Table 2. Incident diagnoses and rates of eye injury, by clinical setting and demographic and military characteristics, active component, U.S. Armed Forces, 2000-2010

	2000-2010			
	Ambulatory		Hospitalization	
	No.	Rate[a]	No.	Rate[a]
Total	182,525	11.65	4,030	0.26
Gender				
Male	156,092	11.66	3,787	0.28
Female	26,433	11.63	243	0.11
Age group				
<20	12,828	8.45	380	0.25
20-24	62,902	11.88	2,005	0.38
25-29	39,891	12.29	812	0.25
30-34	25,265	11.25	419	0.19
35-39	22,265	11.45	229	0.12
>=40	19,374	13.68	185	0.13
Service				
Army	64,479	11.64	1,920	0.35
Navy	45,207	11.67	723	0.19
Air Force	44,769	11.73	455	0.12
Marine Corps	21,572	10.75	870	0.43
Coast Guard	6,498	15.16	62	0.14
Rank				
Enlisted, junior (E1-E4)	83,602	12.19	2,570	0.37
Enlisted, senior (E5-E9)	71,090	11.37	1,159	0.19
Officer, junior (O1-O3,W1-W3)	16,350	10.54	214	0.14
Officer, senior (O4-O10,W4-W5)	11,483	11.52	87	0.09
Occupation				
Enlisted occupations				
Infantry, guncrew, seamen	25,691	11.27	1,351	0.59
Electronic equipment repair	12,966	11.36	199	0.17
Communications & intelligence	12,132	10.06	295	0.24
Healthcare	12,667	14.32	205	0.23
Technical & other professional	4,886	11.90	99	0.24
Functional support & admin	21,363	10.51	307	0.15
Electrical/mechanical repair	35,152	13.17	606	0.23
Craftwork & Construction	8,585	16.88	146	0.29
Service, tranport & supply	13,736	11.00	372	0.30
Students, trainees & unknown	7,514	10.26	149	0.20
Officer occupations				
General/flag ofc & executives	290	13.09	2	0.09
Tactical operations	9,355	10.29	141	0.16
Intelligence	1,304	9.53	14	0.10
Engineering & maintenance	4,022	11.36	22	0.06
Healthcare	4,819	12.08	42	0.11
Scientists & professional	1,472	11.03	15	0.11
Administrative	1,815	10.91	12	0.07
Supply & logistics	2,250	10.65	27	0.13
Students, trainees & unknown	2,506	11.60	26	0.12

[a]Rate per 1,000 person-years

Demographic and military characteristics:

During the 11-year period, the highest incidence rates (unadjusted) of eye injury-related hospitalizations affected service members in enlisted combat-specific occupations (0.59 per 1,000 p-yrs) and in the Marine Corps (0.43 per 1,000 p-yrs). The highest rates of eye-injury-related ambulatory visits affected service members in enlisted craftwork and construction occupations (rate: 16.88 per 1,000 p-yrs), in the Coast Guard (rate: 15.16 per 1,000 p-yrs), in enlisted health care occupations (14.32 per 1,000 p-yrs) and over 40 years of age (13.68 per 1,000 p-yrs) **(Table 2)**.

The overall rate of eye injury-related hospitalizations was more than twice as high among males as females **(Figure 1a)**. However, rates of eye injury-related ambulatory visits (overall) were similar among males and females throughout the period **(Table 2, Figure 1b)**.

The rate of eye injury-related hospitalizations was nearly two times higher among 20-24-year olds (0.38 per 1,000 p-yrs) than those 40 and older (0.13 per 1,000 p-yrs) **(Table 2, Figure 2a)**. Conversely, rates of eye injuries diagnosed during ambulatory visits were highest among the oldest (40 and over: 13.68 per 1,000 p-yrs) and lowest among the youngest (<20 years: 8.45 per 1,000 p-yrs) service members **(Figure 2b)**. Service members in their 20s and 30s had similar outpatient eye injury rates throughout the period.

Among the Services, the overall rate of eye injury-related hospitalizations was highest in the Marine Corps (0.43 per 1,000 p-yrs), intermediate in the Army (0.35 per 1,000 p-yrs) and relatively low in the other Services **(Table 2)**. Among Marines, there was a sharp peak in the eye injury-related hospitalization rate in 2004; in the Army, eye injury-related hospitalization rates were higher from 2004 through 2007 than earlier or later years of the period **(Figure 3a)**. In the Navy and Air Force, annual hospitalization rates for eye injuries remained relatively low and stable throughout the period **(Figure 3a)**. In the Coast Guard, there were fewer than six eye injury-related hospitalizations per year on average during the period.

In contrast to hospitalization experiences among the Services, rates of eye injury-related ambulatory visits were highest in the Coast Guard (15.16 per 1,000 p-yrs), lowest in the Marine Corps (10.75 per 1,000 p-yrs) and intermediate among soldiers, sailors and airmen **(Table 2)**. In the Coast Guard and Navy, annual rates of ambulatory visits for eye injuries increased each year from 2000 to 2004. From 2003 to the end of the period, rates in the Coast Guard were markedly higher than in the other Services **(Figure 3b)**.

Figure 1a. Incidence rates of eye injury hospitalizations, active component, U.S. Armed Forces, 2000-2010

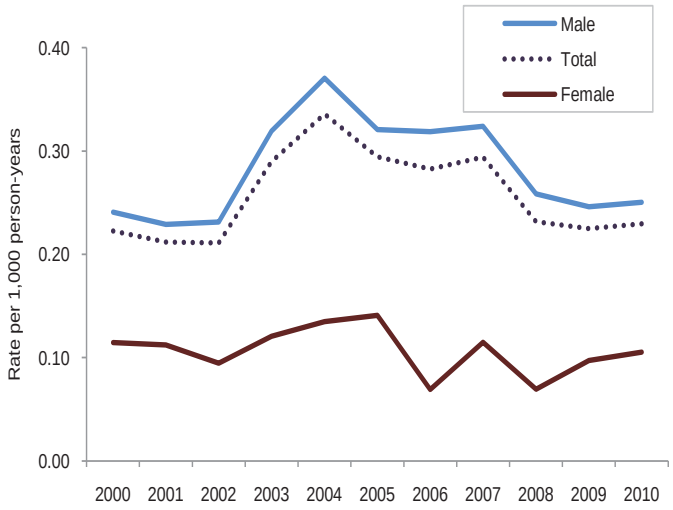
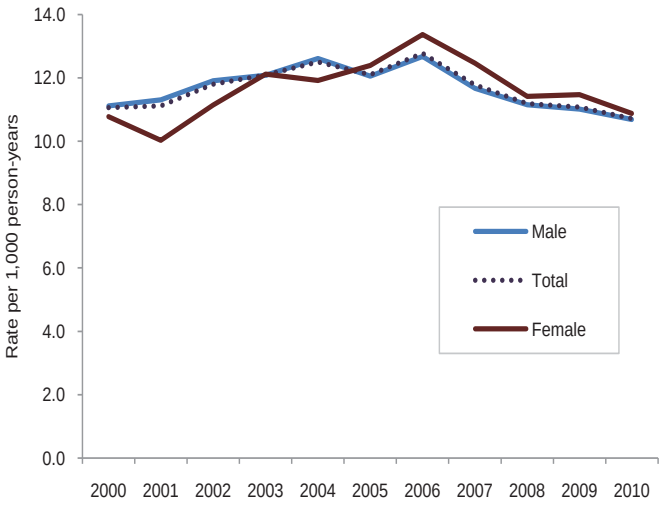


Figure 1b. Incidence rates of eye injury-related ambulatory visits, active component, U.S. Armed Forces, 2000-2010



The rate of eye injury-related hospitalizations (overall) was more than three times higher among junior enlisted service members (E1-4: 0.37 per 1,000 p-yrs) than senior commissioned/warrant officers (O4-10, W4-5: 0.09 per 1,000 p-yrs) – and approximately twice as high among junior than senior (E5-9: 0.19 per 1,000 p-yrs) enlisted members. In contrast, ambulatory visit rates were only slightly higher among junior enlisted service members than other enlisted and officer groups **(Table 2).**

Among enlisted service members, the highest rates of eye injury-specifc ambulatory visits affected those in military occupations related to "craftwork and construction", "health care" and "electrical/mechanical repair". The rate of eye injury-related ambulatory visits (overall) was 50 percent higher among enlisted members in "craftwork and construction" (16.88 per 1,000 p-yrs) than in combat-specific (infantry, guncrew, seamen: 11.27 per 1,000 p-yrs) occupations; however, the rate of hospitalizations for eye injuries was more than twice as high among those in combat-specific than in "craftwork and construction" occupations **(Table 2).** Among officers, "general/flag officers and executives" (13.09 per 1,000 p-yrs) and "intelligence officers" (9.53 per 1,000 p-yrs) had the relatively highest and lowest rates of eye injury-related ambulatory encounters, respectively. Eye injury-related hospitalization rates were higher in all but one of the occupational groups of enlisted members than in any occupational group of officers **(Table 2).**

Clinical categories of injury:

Orbit injuries accounted for more hospitalizations than any other injury type. During the period, orbit injuries accounted for 52 percent of all eye injury-related hospitalizations (n=2,115, rate: 0.14 per 1,000 p-yrs). The rate of orbit injury-related hospitalizations markedly increased from 2002 to 2004 and then remained fairly stable.

Contusions were the next most frequent cause of eye injury hospitalizations (n=1,031, rate: 0.07 per 1,000 p-yrs). The rate of contusion-related hospitalizations remained relatively stable throughout the period **(Table 3, Figure 4a).**

Hospitalizations for injuries with "high risk of blindness" increased sharply from 2002 (rate: 0.03 per 1,000 p-yrs) to 2004 (rate: 0.09 per 1,000 p-yrs) and then declined to near 2002 levels by the end of the period **(Figure 4a).** There was a small peak of hospitalized cases of lid/adenxa injuries in 2006; rates of other eye injury types were generally low and stable throughout the period **(Figure 4a).**

Table 3. Incident eye injuries diagnosed in fixed medical facilities (2000-2010) and deployed medical facilities (2005-2010), by clinical category of injury, active component, U.S. Armed Forces

	2000-2010				2005 - 2010	
	Fixed medical facilites				Deployed medical facilities	
	Ambulatory visits		Hospitalizations			
	No.	Rate[a]	No.	Rate[a]	No.	% total
Total	182,525	11.65	4,030	0.26	8,323	100
Superficial injuries	133,274	8.51	532	0.03	6,505	73.98
High risk of blindness	4,154	0.27	698	0.04	229	2.98
Contusion	24,223	1.56	1,031	0.07	822	9.38
Orbit	9,571	0.61	2,115	0.14	207	2.38
Lid/adnexa	9,758	0.62	718	0.05	328	4.26
Posterior segment	7,539	0.48	292	0.02	71	0.80
Burns	4,843	0.31	138	0.01	406	4.86
Anterior segment	2,572	0.16	51	0.00	91	1.12
Optic/cranial nerve	798	0.05	138	0.01	21	0.23

[a]Rate per 1,000 person-years

Figure 2a. Incidence rates of hospitalizations for eye injuries, by age group, active component, U.S. Armed Forces, 2000-2010

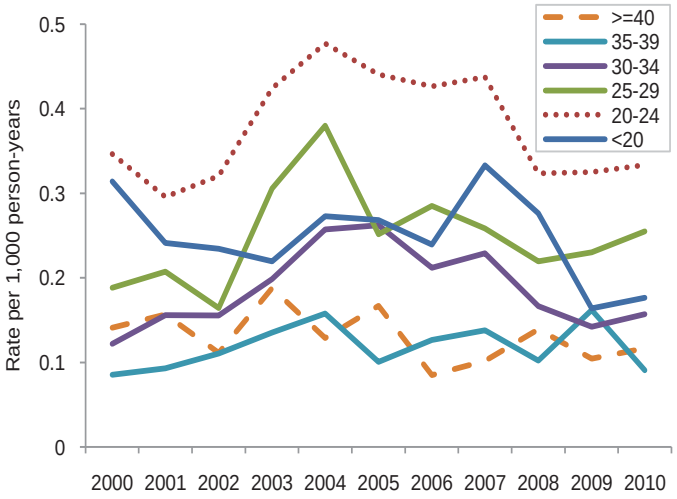


Figure 2b. Incidence rates of eye injury-related ambulatory visits, by age group, active component, U.S. Armed Forces, 2000-2010

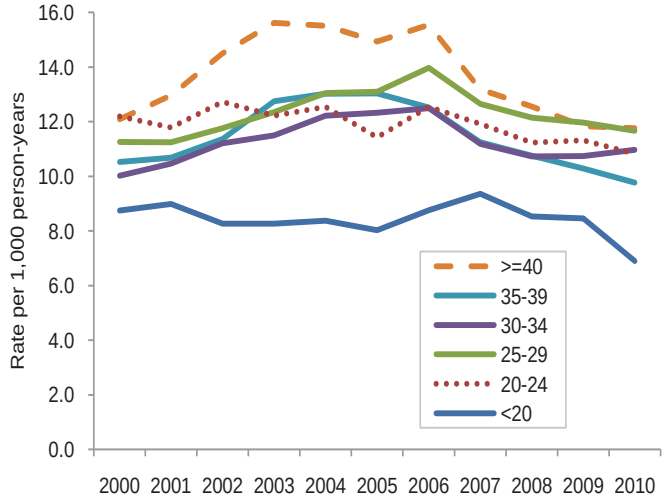


Figure 3a. Incidence rates of hospitalizations for eye injuries, by service, active component, U.S. Armed Forces, 2000-2010

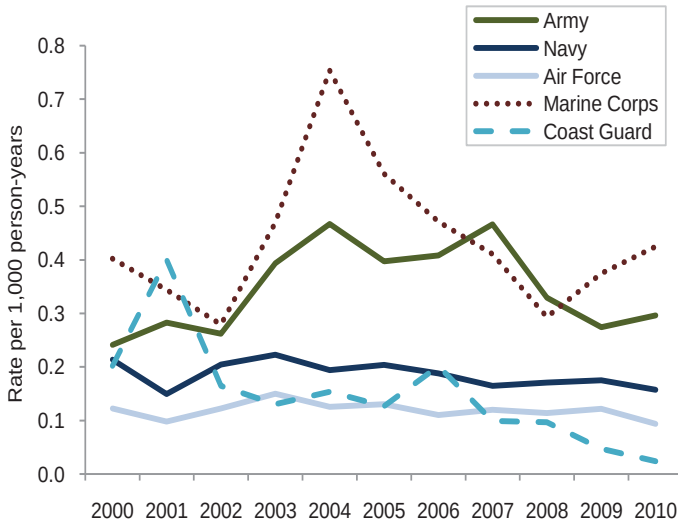
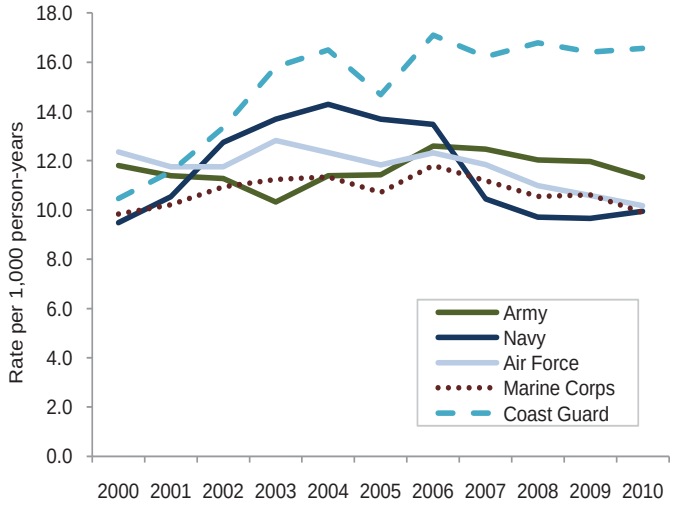


Figure 3b. Incidence rates of eye injury-related ambulatory visits, by service, active component, U.S. Armed Forces, 2000-2010



Superficial injuries (n=133,274, overall rate: 8.51 per 1,000 p-yrs) and contusions (n=24,223, overall rate: 1.56 per 1,000 p-yrs) accounted for 73 percent and 13 percent of all eye injuries treated during ambulatory visits, respectively **(Table 3, Figure 4b)**. Two percent of all eye injury-related outpatient encounters were considered "high risk of blindness" injuries (n=4,154, overall rate: 0.27 per 1,000 p-yrs).

During the period, annual rates of ambulatory visits for contusions and orbit injuries generally increased, rates of high risk of blindness injuries decreased, rates of lid/adnexa injuries decreased from 2004 to 2010, and rates of other injury types were relatively low and stable **(Figure 4b)**.

Cause of injury codes were reported during 57 percent (n=2,311) of all eye injury-related hospitalizations. "Guns and explosives", transportation-related accidents and fights, brawls, assaults were the most frequently reported causes of hospitalized eye injury cases, among those with a reported cause **(Table 4)**. Approximately 8 percent of all hospitalized eye injuries were reported as "battle-related."

Cause of injury codes were reported for fewer than 13 percent (n=23,402) of all eye injury-related ambulatory encounters. The most frequently reported causes of eye injuries treated in outpatient settings were "machinery and tools", "slips, trips and falls" and fighting/assault **(Table 4)**.

Eye injuries treated in deployed settings (2005-2010):

Between 2005 and 2010, 8,323 incident eye injuries were reported from deployed medical treatment facilities **(Table 3)**. Most injuries affected service members who were enlisted (89%), male (86%), aged 20-29 (67%) and in the Army (59%) (data not shown). Nearly three-fourths of the injuries were considered "superficial" **(Table 3)**. Of all eye injuries treated in deployed and fixed ambulatory clinics, the distributions by

Figure 4a. Incidence rates of eye injury hospitalizations by clinical category of injury, active component, U.S. Armed Forces, 2000-2010

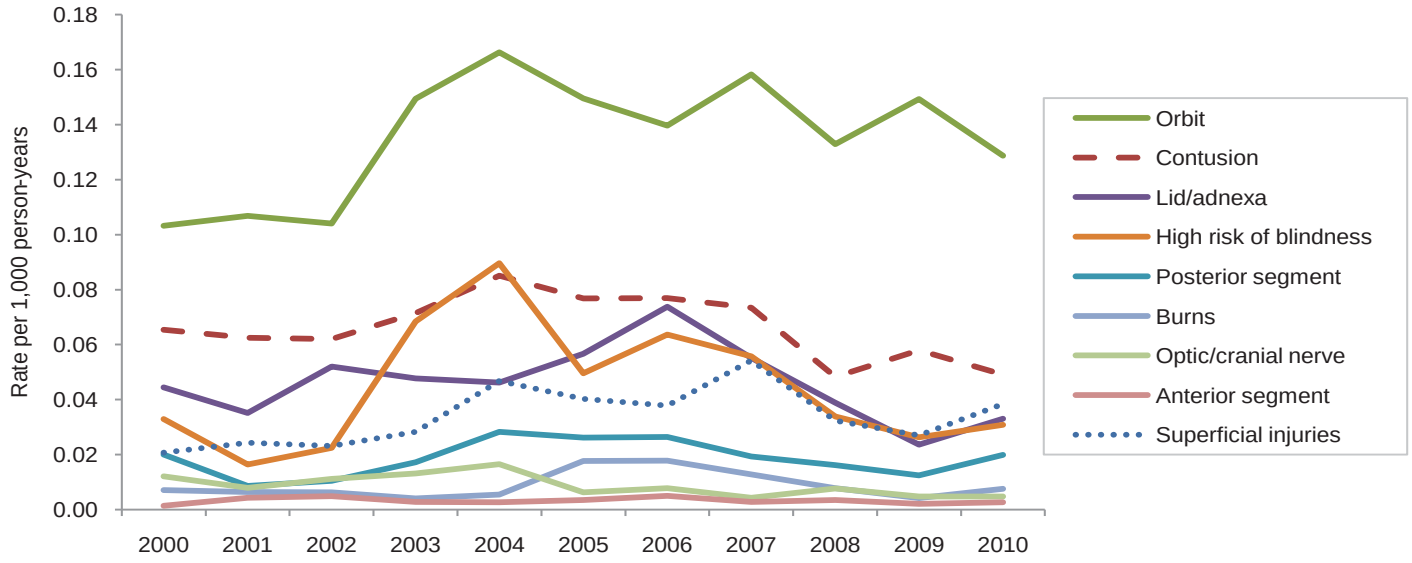
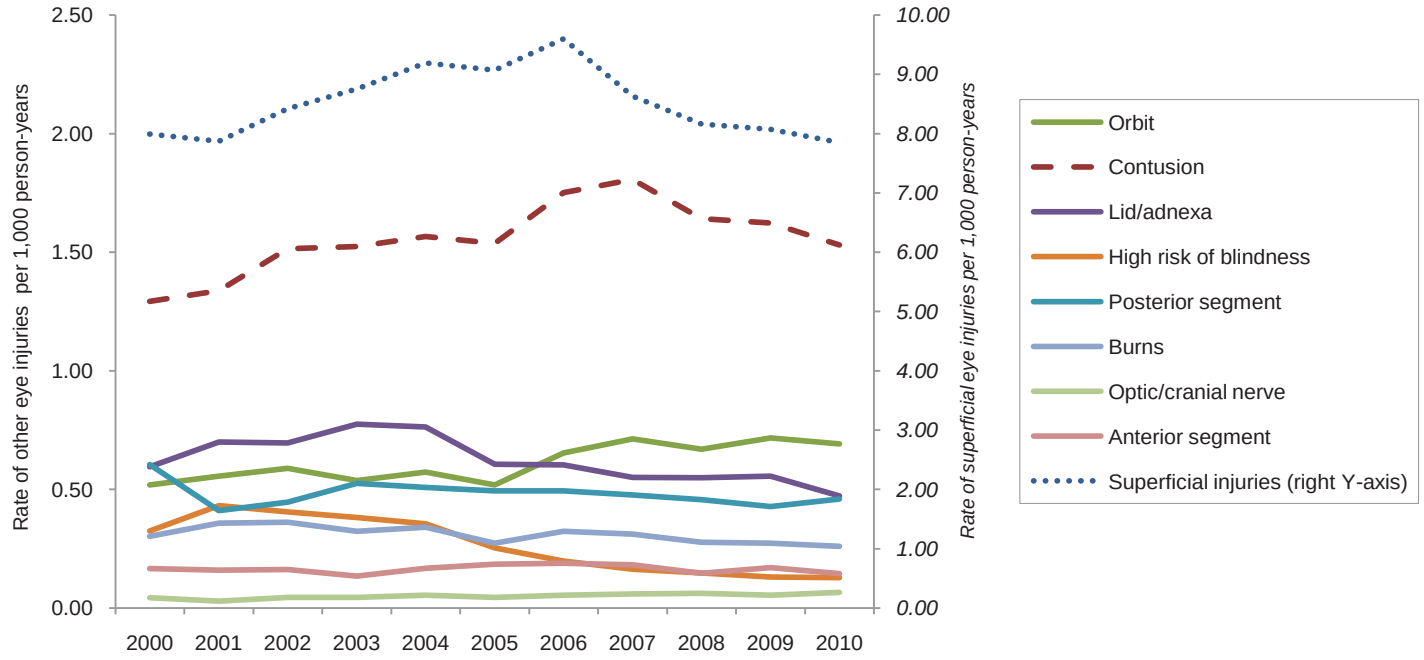


Figure 4b. Incidence rates of ambulatory visits for superficial (right Y-axis) and other eye injuries (left Y-axis), active component, U.S. Armed Forces, 2000-2010



clinical categories were generally similar. Of note, however, there were relatively more burns, and relatively fewer orbital injuries and contusions, treated in deployed than in fixed ambulatory clinics.

Editorial comment:

This report documents that most by far (98 percent) of eye injuries of active component U.S. military members are treated in ambulatory settings. Of note, however, there are marked differences in epidemiologic and clinical characteristics of eye injuries treated during hospitalizations and outpatient clinics. For example, service members who sustain eye injuries that require hospital treatment are relatively likely to be 20-24 years old, males, in combat-specific occupations, and in the Army or Marine Corps. The majority of all hospital-treated eye injuries are fractures or penetrating wounds of the orbit; they are most frequently caused by guns/explosives, motor vehicle accidents, and fights or assaults. In contrast, service members who sustain eye injuries that are treated in outpatient settings are relatively likely to be in craftwork or construction occupations and aged 40 and older. Nearly three-quarters of all outpatient treated eye injuries are superficial injuries; they are most frequently caused by accidents with machinery and tools, and slips, trips, and falls.

Table 4. Eye injuries by cause[a], active component, U.S. Armed Forces, 2000-2010

Cause	Ambulatory visits		Hospitalizations	
	No.	%	No.	%
Battle casualty[b]	84	0.0	311	7.7
Guns and explosives	965	0.5	706	17.5
Sports	2,024	1.1	103	2.6
Machinery and tools	10,895	6.0	149	3.7
Transport	802	0.4	469	11.6
Slips, trips and falls	6,012	3.3	203	5.0
Fights, assault, horseplay	2,620	1.4	370	9.2
Other or unknown cause	159,123	87.2	1,719	42.7

[a]Causes determined by "E-codes" and by codes specified in NATO Standardization Agreement (STANAG) No. 2050
[b]Includes accidents with guns and explosives during war

There are several limitations of this report that should be considered when interpreting the results. For example, for more than 40 percent of hospitalized and nearly 90 percent of ambulatory treated injuries, the causes of the injuries were not reported. The relatively few causes that were reported may not reliably indicate the causes of eye injuries among U.S. military members overall.

Also, the report summarizes injuries to members of the active component of the U.S. military services if they were treated in "fixed" (e.g., U.S. military and contracted/reimbursed civilian) or deployed (from 2005 to 2010) medical facilities. Thus, the report does not account for injures to members of the reserve components or those treated (but not systematically reported) during field training exercises, at sea, by medics in direct support of military units ("aid bag" care), and so on. As a result, the findings of this report underestimate the numbers of eye injuries that affect U.S. military members overall.

In addition, interpretations of trends of eye injuries described in this report should consider the significant variability during the surveillance period in the numbers and locations of deployed service members; the natures (e.g., improvised explosive devices [IEDs]) and frequencies of enemy attacks and the numbers of service members directly affected by them; compliance with use of protective eyewear during eye hazardous activities; the intensity of training and support activities; the overall operational tempo; and so on. These factors are likely determinants of risk of eye injuries; and since 2002, the overall risk of eye injuries to U.S. military members has undoubtedly increased. Yet, the rate of outpatient-treated eye injuries was lower and the rate of hospitalized cases was very similar in 2010 compared to 2000.

Annual rates of hospitalized eye injuries sharply increased from 2002 to 2004 and then generally declined through 2008. The sharp rise in hospitalized cases from 2002 to 2004 was concurrent with increasing numbers of deployed service members and combat-specific activities (including IED attacks) – and poor compliance with the use of protective eyewear[5] – in Afghanistan and Iraq. The Military Combat Eye Protection (MCEP) program was initiated in late 2004. From 2004 through 2008, inpatient eye injury rates sharply declined while enemy initiated attacks on U.S. forces in Iraq generally increased. The results suggest that the increased use of eye protection accounted at least in part for lower eye injury rates among deployed service members. In addition, to the extent that MCEP became accepted by unit commanders and noncommissioned officers as necessary and important personal protection equipment during wartime operations, MCEP use spread beyond the deployed environment to recruit and deployment training, and even home use.

Increases in awareness, acceptance, and use of eye protection remain primary objectives of efforts to reduce rates as well as clinical and military operational effects of eye injuries among U.S. military members. Recent operations in Iraq and Afghanistan have raised awareness of the need for eye protection and acceptance of the MCEP program among commanders, noncommissioned officers, and service members at all levels. Future efforts should insure that awareness, acceptance, and use of eye protection do not fade after the current conflicts end. All military members should be informed and repeatedly reminded of the benefits of the use of eye protection – on the job and at home. MCEP use should be required during training activities, deployment operations, and in all other settings where ballistic eye hazards exist.

Reported by: David J. Hilber, COL, MS, USA. *The author acknowledges Mark Reynolds, MAJ, MC, USA for his 2008 eye injury summary cited as reference 2.*

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Stress Fractures, Active Component, U.S. Armed Forces, 2004-2010

Stress fractures are overuse injuries that occur in response to repetitive stresses (e.g., running, marching, jumping) to bones. The majority of stress fractures affect persons with normal bones who suddenly increase their physical activity. Clinically, stress fractures are characterized by localized pain of insidious onset that follows increased activity or training, worsens progressively with activity, and is relieved by rest.[1]

Intrinsic risk factors for stress fractures include increasing age, female gender, white, non-Hispanic race, and poor body mechanics.[2-5] Modifiable risk factors include body mass index (BMI) outside the normal range, poor fitness level, cigarette smoking, diet low in calcium, inappropriate footgear, and training characteristics (e.g., intensities, surfaces).[4] Participants in high-intensity training, such as athletes and military recruits, are at relatively high risk of stress fractures. Repetitive weight-bearing activities, particularly running and marching, are the most frequently reported causes of stress fractures.[6]

In general, the tibia, fibula, and metatarsals are the anatomical sites most frequently affected by stress fractures; however, stress fracture sites vary in relation to the precipitating activity.[7] In the U.S. military, stress fractures are significant obstacles to military operational effectiveness and substantial burdens to the military medical system.[4,8] Of particular note, among basic trainees, stress fractures account for more lost duty days and training recycles (i.e., delays in the completion of training) than any other training-related injury.[4]

This analysis summarizes numbers, incidence rates, and demographic and military correlates of risk of stress fractures among active component members of the U.S. Armed Forces from 2004 through 2010.

Methods:

The surveillance period was January 2004 through December 2010. The surveillance population included all individuals who served in the active component of the U.S. Armed Forces any time during the surveillance period. All data used for analyses were derived from records of hospitalizations and outpatient encounters that are routinely maintained in the Defense Medical Surveillance System (DMSS) for health surveillance purposes.

For this analysis, all medical encounter records that included diagnoses of stress fractures of the tibia/fibula, metatarsals, femoral neck, femoral shaft, pelvis, or other bone (ICD-9-CM codes: 733.93-733.98) were ascertained. Incident cases were defined as a hospitalization with a stress fracture-specific diagnosis code in any diagnostic position; or as two outpatient encounters at least 14 days but less than 180 days apart that included the same stress fracture-specific diagnosis code. Each individual could be considered an incident case only once during any 180-day interval.

Results:

During the seven-year surveillance period, there were 31,349 incident stress fractures (rate: 3.24 per 1,000 person-years [p-yrs]) among active component members. The overall incidence rate was approximately 18 times higher among recruits (43.75 per 1,000 p-yrs) than non-recruits (2.39 per 1,000 p-yrs) **(Figure 1).**

Among recruits, annual incidence rates of stress fractures (overall) declined by 30 percent from 2005 (52.45 per 1,000 p-yrs) to 2010 (36.37 per 100,000 p-yrs). Among non-recruits, rates of stress fractures were relatively low and stable throughout the period **(Figure 1).**

Among military members overall, the anatomic sites most frequently affected by stress fractures were "other bones" (n=12,975; 41.4%), tibia/fibula (n=12,112; 38.6%), and metatarsals (n=4,460; 14.2%). The anatomic distributions of stress fractures were similar among recruits and non-recruits **(Figure 2).**

Among both recruits and non-recruits, rates of stress fractures of "other bones" peaked in 2007 and then sharply declined through 2010 **(Figure 3).** Among recruits, rates of tibia/fibula fractures markedly decreased from 2004 through 2008, and rates of metatarsal fractures declined from 2005 through 2008. In contrast, among non-recruits, rates of

Figure 1. Incident cases and incidence rates of stress fractures among recruits and non-recruit active component members, U.S. Armed Forces, 2004-2010

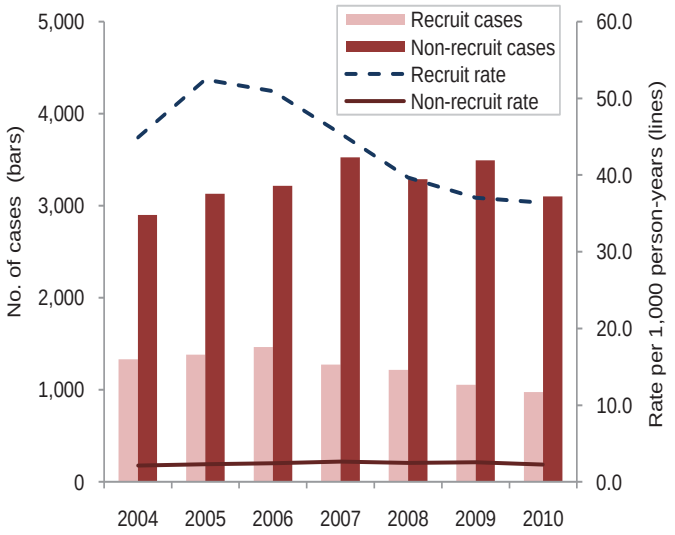
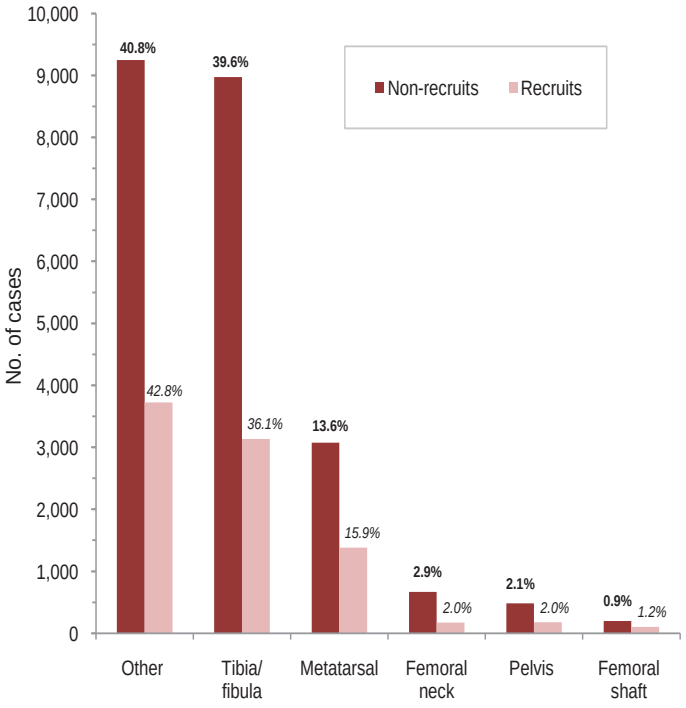


Figure 2. Number and percent distribution of incident stress fractures, by anatomical location, among recruit and non-recruit active component members, U.S. Armed Forces, 2004-2010



tibia/fibula and metatarsal fractures were relatively stable throughout the period **(Figure 3)**.

Tibia/fibula stress fractures

During the surveillance period, there were 3,137 and 8,975 incident tibia/fibula stress fractures among recruits (overall rate: 15.78 per 1,000 p-yrs) and non-recruits (overall rate: 0.95 per 1,000 p-yrs), respectively. Tibia/fibula stress fracture rates sharply increased with age among recruits and markedly decreased with age among non-recruits **(Table 1)**. Among both recruits and non-recruits, tibia/fibula stress fracture rates were more than twice as high among females than males **(Table 1)**.

Among non-recruits, tibia/fibula stress fractures rates were more than twice as high in the Army than any other Service. However, among recruits, tibia/fibula stress fracture rates were much higher among Marines than other Service members **(Table 1)**. During the surveillance period, the Marine Corps Recruit Depots at San Diego, CA, and Parris Island, SC, and the Naval Training Center at Great Lakes, IL, each accounted for approximately 20 percent of all tibia/fibula stress fractures among U.S. military recruits **(Table 2)**. Of note, beginning in 2004, rates of tibia/fibula stress fractures declined by more than 60 percent among Marine recruits (through 2009) and 80 percent among Navy recruits (through 2008). In contrast, rates of tibia/fibula stress fractures markedly increased among Air Force recruits (through 2009) and were relatively stable among Army recruits throughout the surveillance period **(Figure 4)**.

Table 1. Incident cases and incidence rates of stress fractures of the tibia/fibula among recruit and non-recruit active component members, U.S. Armed Forces, 2004-2010

	Non-recruits			Recruits		
	No.	%	Rate[a]	No.	%	Rate[a]
Total	8,975	100	0.95	3,137	100	15.78
Age						
<20	1,606	18	2.51	1,323	42	12.08
20-24	3,404	38	1.06	1,283	41	17.73
25-29	1,959	22	0.93	363	12	27.07
30-34	1,032	11	0.74	145	5	44.58
35-39	639	7	0.55	23	1	92.60
40+	335	4	0.37	.	.	.
Gender						
Male	6,173	69	0.76	2,219	71	13.21
Female	2,802	31	2.06	918	29	29.80
Service						
Air Force	776	9	0.34	250	8	7.80
Army	6,031	67	1.71	951	30	12.44
Marine Corps	908	10	0.78	1,301	41	26.41
Navy	1,229	14	0.54	604	19	15.99
Coast Guard	31	0	0.12	31	1	9.53
Race						
White, non-Hispanic	5,475	61	0.92	2,176	69	16.30
Black, non-Hispanic	1,622	18	1.01	329	10	12.28
Hispanic	1,107	12	1.12	297	9	14.81
American Indian/ Alaskan Native	135	2	0.82	77	2	17.75
Asian/Pacific Islander	435	5	0.96	160	5	18.44
Other	53	1	0.73	50	2	12.73
Unknown	148	2	0.69	48	2	31.07
BMI at accession						
Underweight	205	2	1.34	122	4	27.56
Normal	4,319	48	1.14	1,613	51	15.14
Overweight	2,774	31	1.14	1,100	35	15.88
Obese	562	6	1.58	181	6	14.64
Unknown BMI	1,115	12	0.41	121	4	19.47

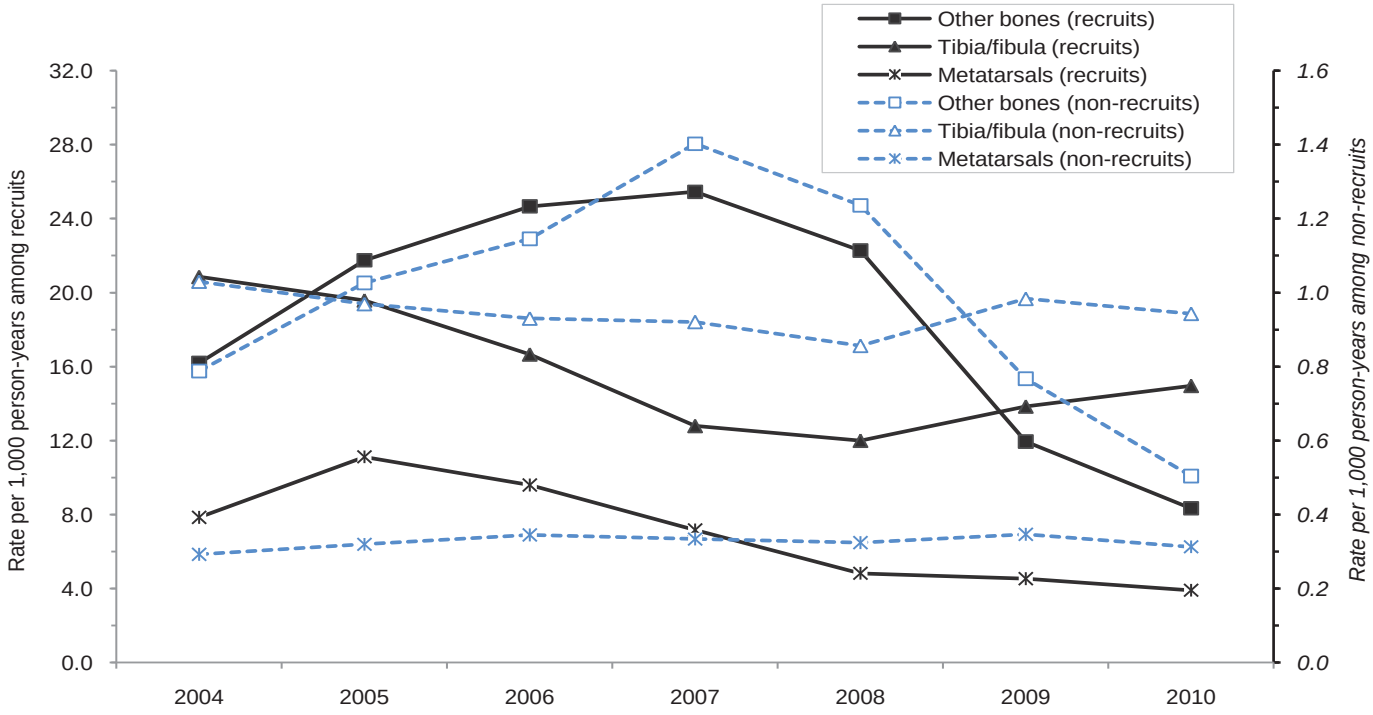
[a]Rates expressed as incident cases per 1,000 person-years of military service

Table 2. Incident cases and incidence rates of tibia/fibula stress fractures in recruits by training location, active component, U.S. Armed Forces, 2004-2010

Training location	No.	% total	Rate[a]	Incidence Rate Ratio (IRR)
MCRD San Diego	688	21.9	28.9	Ref
MCRD Parris Island	613	19.5	24.1	0.83
NTC Great Lakes	604	19.3	16.0	0.55
Ft. Benning	339	10.8	16.3	0.57
Ft. Leonard Wood	257	8.2	19.1	0.66
Lackland AFB	250	8.0	7.7	0.27
Ft. Jackson	202	6.4	8.0	0.28
Ft. Knox	128	4.1	15.8	0.55
CGTC Cape May	31	1.0	9.5	0.33
Ft. Sill	25	0.8	2.9	0.10

[a]Rates expressed as incident cases per 1,000 person-years of military service

Figure 3. Annual incidence rates of stress fractures, by selected anatomic locations, among recruits (left Y-axis) and non-recruits (right Y-axis) active component members, U.S. Armed Forces, 2004-2010



Finally, among recruits and non-recruits, crude rates of tibia/fibula stress fractures did not markedly vary across racial-ethnic subgroups. However, tibia/fibula stress fracture rates were much higher among recruits with BMIs indicative of "underweight" and slightly higher among non-recruits with BMIs associated with "obesity" **(Table 1).**

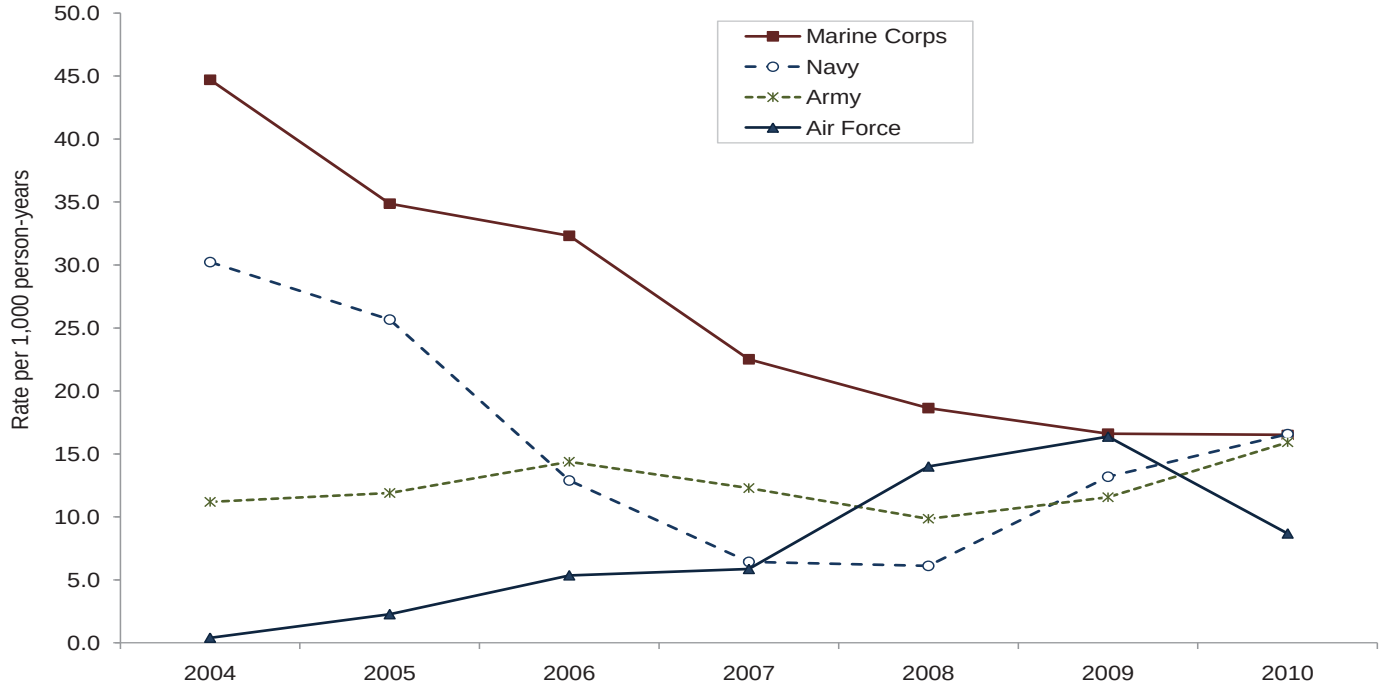
Editorial comment:

This report reemphasizes the fact that recruits are at much higher risk of stress fractures than more experienced military members. During the seven-year period reviewed for this report, annual stress fracture rates (all sites) were 15 to 23 times higher among recruits than non-recruits. Of note in this regard, rates of stress fractures among recruits (overall) decreased each year from 2005 through 2010. The decline was most apparent in relation to stress fractures of bones of the foot (metatarsals) and lower leg (tibia/fibula).

The findings of this report should be interpreted with consideration of several limitations. For example, in 2008, the ICD-9-CM code list expanded to enable more specificity in reporting the anatomic sites of stress fractures (i.e., pelvis, femoral neck, femoral shaft). Sharp declines in rates of stress fractures of "other bones" beginning in 2008 undoubtedly reflect, at least in part, the availability of more specific diagnostic codes. Also, the surveillance case definition used for this report relied exclusively on stress fracture-specific ICD-9-CM codes that were reported on administrative records of medical encounters in fixed (e.g., not deployed, at sea) medical facilities. Thus, there was no radiographic confirmation of the diagnoses, severities, or anatomic sites of the reported fractures. In addition, this report summarized stress fractures among active component members only. However, all reserve and National Guard members undergo recruit training; thus, it is likely that significant proportions of all stress fractures among U.S. military members affect reserve component members. Undoubtedly, the results presented here underestimate the actual numbers, military operational impacts, and health care burdens of stress fractures among U.S. military members. Also, the body mass indexes (BMIs) that were used for analyses in this report were those reported at the times of service members' accession to military service. Thus, in some cases, the BMIs at the times of incident stress fracture diagnoses may have differed significantly from those used for analysis. Finally, the effects of predisposing conditions for stress fractures were not accounted for in the crude (unadjusted) analyses conducted for this report.

Despite the limitations, there are informative and potentially useful findings of the analyses. For example, in 2004, rates of stress fractures of the tibia/fibula were much higher among Marine Corps and Navy recruits than those of the other Services. However, from 2004 through 2010, rates of lower leg stress fractures very sharply declined among Marine Corps and Navy recruits; of note, in 2010, rates of lower leg stress fractures were very similar among Marine Corps, Navy, and Army recruits. The decrease in lower leg stress fractures among Marine Corps recruits likely reflects a change in the recruit training schedule that was implemented in 2003. The revised schedule aimed to reduce injuries by increasing recovery time between intense physical training.

Figure 4. Annual incidence rates of stress fractures of lower leg (tibia/fibula) among recruits, by service, active component, U.S. Armed Forces, 2004-2010



Similarly, the decrease in lower leg stress fractures among Navy recruits likely reflects changes in recruit training since 2003; the changes included an increase in the minimum hours of sleep at night and a reduction of cumulative marching distance during recruit training. The changes were based on the findings of stress fracture prevention studies in the U.S. and experiences of other military forces. The changes have been linked to a decrease in attrition from Navy recruit training and reductions in stress fracture risk.[9,10] In contrast, the increase in lower leg stress fracture rates among Air Force recruits since 2005 may reflect changes in recruit basic training that were implemented in November 2005; the changes toughened recruit physical fitness standards and training and increased emphasis on deployment-related training (i.e., combat-specific activities, weapons training). Also, in 2008, the Air Force lengthened its basic training from 6½ to 8½ weeks. Of note, in 2010, the rate of lower leg stress fractures among Air Force recruits was lower than the rates among the recruits of the other Services. Together, the findings indicate that recruit training schedules can be designed to minimize stress fracture risk without compromising the military training mission.

Particularly among military recruits, stress fractures are significant obstacles to military operational effectiveness and substantial burdens to the military health system. Preventive interventions that have been found effective in research studies and lessons learned from the experiences of recruit training centers should be incorporated into recruit training schedules and practices. The effects of changes in training schedules and practices should be systematically monitored, and those that reduce injuries without compromising training should be widely implemented.

Reported by: CPT Dara Lee, MC, USA

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Trends in Emergency Medical and Urgent Care Visits, Active Component, U.S. Armed Forces, 2000-2010

In 2007, approximately 9.2 million individuals were eligible for care through the U.S. military health system (MHS); the MHS beneficiary population included 1.4 million active service members, 1.8 million retirees, and 6 million family members and other eligible "dependents." A recent summary of emergency department (ED) visits by beneficiaries of the MHS from 2002 to 2007 revealed increasing rates; the highest annual rate during the period was 47 visits per 100 beneficiaries in 2007. ED visit rates overall and the clinical categories that accounted for the most ED visits – injuries and poisonings, signs and symptoms of ill-defined conditions, and respiratory diseases – were similar among military beneficiaries and civilians.[1]

This report documents frequencies, rates, trends and characteristics of visits to emergency medical care or urgent care (EM) clinics at fixed military treatment facilities among active component members of the U.S. Armed Forces from 2000 to 2010.

Methods:

The surveillance period was from 1 January 2000 to 31 December 2010. The surveillance population included all individuals who served in the active component of the Army, Navy, Air Force, Marine Corps or Coast Guard at any time during the surveillance period.

All ambulatory visits at fixed military medical facilities of active component members during the surveillance period were identified from records routinely maintained in the Defense Medical Surveillance System (DMSS). Visits to emergency medicine (EM) clinics were identified through Medical Expense and Reporting System (MEPRS) codes; records of visits that included MEPRS codes of BHI (immediate care clinic) or beginning with BI (emergency medical care) were included in summary statistics. Each individual could be counted only once per day for an EM clinic visit. Records of emergency visits not documented with automated records (e.g., during deployments, field training exercises, at sea) were not included. Also, emergency visits to non-military facilities (reimbursed through the MHS) were not included because MEPRS codes are not routinely reported for such visits.

EM visits were categorized according to the first three digits of the primary (first-listed) diagnosis code (International Classification of Diseases, 9th revision, clinical modifications [ICD-9-CM]). In addition, visits were categorized according to a classification system used by the Centers for Disease Control and Prevention (CDC) in its annual summaries of civilian emergency department visits.[2]

Results:

Frequencies, rates, and trends

From 2000 through 2010, there were 5,334,166 visits of active component members to EM clinics at fixed (e.g., not deployed, at sea) military medical facilities. During the period, annual numbers of EM visits increased by approximately 11 percent (2000: 460,084 visits; 2010: 512,613 visits); however, there was no clear trend in rates of EM visits (all causes) throughout the period. The lowest and highest annual rates were in 2003 (329.1 per 1,000 person-years [p-yrs]) and 2009 (371.1 per 1,000 p-yrs), respectively **(Figure 1)**.

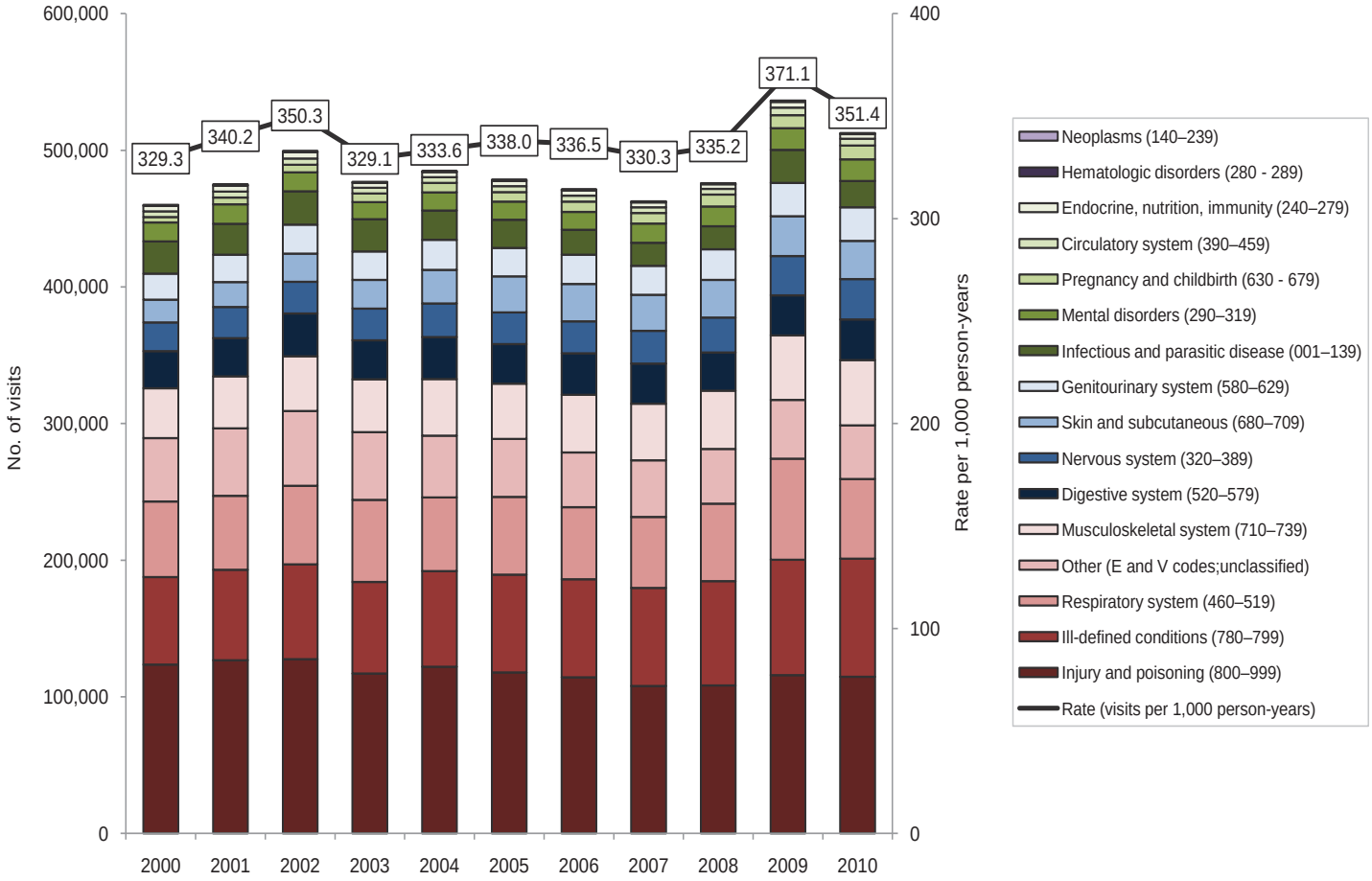
Over the entire surveillance period, males accounted for approximately three-fourths of all EM visits; however, the crude rate of visits was slightly more than twice as high in females (608.5 visits/1,000 p-yr) as males (295.1 visits/ 1,000 p-yr). While white, non-Hispanics accounted for approximately 60 percent, of all EM encounters; black, non-Hispanics had the highest rate of visits (419.6/ 1,000 p-yrs).

Table 1. Emergency department/urgent care visits and incidence rates, active component, U.S. Armed Forces, 2000-2010

	Total (2000-2010)		
	No.	%	Rate[a]
Total	5,334,166	100.00	340.5
Age group			
17-19	608,553	11.41	518.7
20-24	2,108,146	39.52	404.1
25-29	1,102,060	20.66	327.4
30-34	619,369	11.61	272.7
35-39	474,581	8.90	237.2
40+	421,457	7.90	257.6
Gender			
Male	3,951,394	74.08	295.1
Female	1,382,772	25.92	608.5
Race/Ethnicity			
White, non-Hispanic	3,177,983	59.58	320.7
Black, non-Hispanic	1,157,950	21.71	419.6
Hispanic	516,893	9.69	329.5
Asian/Pacific Islander	204,305	3.83	289.0
Amerindian/Alaska native	93,618	1.76	365.9
Other	183,417	3.44	394.9
Service			
Army	2,378,758	44.59	429.5
Navy	1,224,266	22.95	316.0
Air Force	1,084,752	20.34	284.3
Marine Corps	614,743	11.52	306.2
Coast Guard	31,647	0.59	73.8

[a]Rate per 1,000 person-years

Figure 1. Number and rate of ER visits, by year and major diagnostic category, active component, U.S. Armed Forces, 2000-2010



17-19 years olds had the highest visit rate (518.7/1,000 p-yrs), although those between the ages of 20-29 accounted for over 60 percent of all EM visits **(Table 1).**

Emergency and immediate care visits, by diagnostic categories:

During the surveillance period, visits for injuries and poisonings (n=1,295,833) accounted for nearly one-fourth of all emergency/urgent care visits. Sprains and strains (n=420,263), open wounds (n=237,007), and contusions (n=176,066) were the most frequent specific diagnoses reported during injury/poisoning-related visits **(data not shown).**

"Signs, symptoms, and ill-defined conditions" and respiratory illnesses accounted for nearly 15 percent (n=798,983) and 12 percent (n= 631521) of all emergency/urgent care visits, respectively **(Figure 1).** Throughout the period, "acute upper respiratory infections" accounted for most of the respiratory illness-related EM visits; and in 2010, "acute upper respiratory infections" accounted for more than 5 percent of all EM visits and was the most frequent specific diagnosis overall **(Table 2).**

"Other signs, symptoms and ill-defined conditions" and "spinal disorders" (which includes intervertebral disc disorders, spondylosis, and other disorders of the back) were the second and third most frequent categories of illnesses and injuries diagnosed during EM visits **(Table 2).** The same specific diagnoses were the five most frequently reported diagnoses each year of the period and overall **(data not shown).**

Following emergency/urgent care encounters, approximately 85 percent of military members were returned to duty without limitations, while slightly more than three percent were hospitalized **(data not shown).**

Editorial comment:

During the past eleven years, annual numbers of illness and injury-related emergency and urgent care visits by active component members increased slightly; however, there were not consistent increases in rates of emergency/urgent care visits from year to year.

In a similar analysis of emergency room visits among U.S. civilians, Tang and colleagues reported a 23 percent increase in emergency visits from 1997 to 2007. The estimated rate of emergency department visits among 18-44 year olds (the age group most comparable to active component members) in 2007 was 432.6 per 1,000 p-yrs. The higher rates and increasing trends of emergency visits among civilians in

Table 2. Most frequently reported primary diagnoses during emergency medical visits, by diagnosis group[2], active component, U.S. Armed Forces, 2010

Diagnosis group[2]	No.	%
Acute upper respiratory infections, excluding pharyngitis	26,540	5.2
Other symptoms, signs and ill defined conditions	25,302	4.9
Spinal disorders	23,240	4.5
Other factors influencing health status and contact with health	20,786	4.1
Sprains and strains, excluding ankle and back	17,939	3.5
Abdominal pain	16,900	3.3
Contusion with intact skin surface	14,939	2.9
Acute pharyngitis	13,867	2.7
Cellulitis and abscess	13,344	2.6
Noninfectious entertis and colitis	12,939	2.5
Chest pain	12,783	2.5
Open wound, excluding head	12,484	2.4
Sprains and strains of neck and back	11,441	2.2
Arthropathies and related disorders	11,366	2.2
Rheumatism, excluding back	11,265	2.2
Other injuries	10,857	2.1
Sprains and strains of ankle	10,589	2.1
Complications of pregnancy, childbirth, and the puerperium	10,247	2.0
Headache	10,247	2.0
Specific procedures and aftercare	9,146	1.8

contrast to their military counterparts reflects important differences between the groups. For example, military members are carefully medically screened prior to entering service, have unlimited access to healthcare at no cost to themselves during service, and are required to undergo special and periodic medical examinations throughout their service. Also, military members have ready access to preventive services and unit level programs aimed at reducing injury and illness. In contrast, in civilian communities, medically underserved patients may have difficulty accessing primary care services other than through emergency departments.[3]

There are limitations to this report that should be considered when interpreting the findings. For example, emergency and urgent care visits were ascertained through Medical Expense and Reporting System (MEPRS) codes that were documented on administrative records of medical encounters in fixed (e.g., not deployed) U.S. military medical facilities. As such, emergency and urgent care visits of active component members in non-military (e.g., emergency rooms of civilian hospitals) and deployed (e.g., Iraq, Afghanistan, aboard ships) medical facilities were not included in summaries. As a result, the numbers and rates reported here underestimate the actual numbers and rates of emergency/urgent care visits of active component members during the period. Also, because the causes of emergency/urgent care visits likely differ in deployed and non-deployed settings, the summaries of causes of and dispositions after emergency/urgent care visits reported here may not reliably reflect the experiences of active component members overall.

For this report, emergency/urgent care encounters for various categories of illnesses and injuries were summarized using a CDC-defined classification system; the system includes a category for "spinal disorders" which accounted for the third most emergency/urgent care encounters. Of note, the "spinal disorders" category includes back disorders (ICD-9-CM 720-724: spondylosis, intervertebral disc disorders, other disorders of the cervical region and back); in past MSMR reports, back disorders have been consistently among the most common causes of ambulatory visits, hospitalizations, and medical evacuations of service members. The relative importance of "spinal disorders" as a cause of emergency/urgent care in this report reflects the ongoing importance of back disorders as causes of morbidity among active service members.

In summary, this analysis documents that, during the past 11 years, injuries (e.g., sprains, strains, lacerations, contusions), "ill-defined" conditions (e.g., signs and symptoms), and acute upper respiratory infections accounted for more emergency/urgent care visits of military members than any other specific causes; of note, the illnesses and injuries that accounted for the most emergency/urgent care visits during the period were similar to those that caused the most ambulatory visits among service members overall.[4] Also, after emergency/urgent care visits, most affected service members returned to duty without limitations; only approximately one of 30 required hospitalization. Thus, most emergency/urgent care visits of military members are for injuries and acute illnesses that are very common but not clinically severe or seriously disruptive of the military operational effectiveness of those affected. Continued emphasis on measures to prevent acute traumatic injuries (e.g., sprains, strains, contusions) and back disorders is warranted. [5,6]

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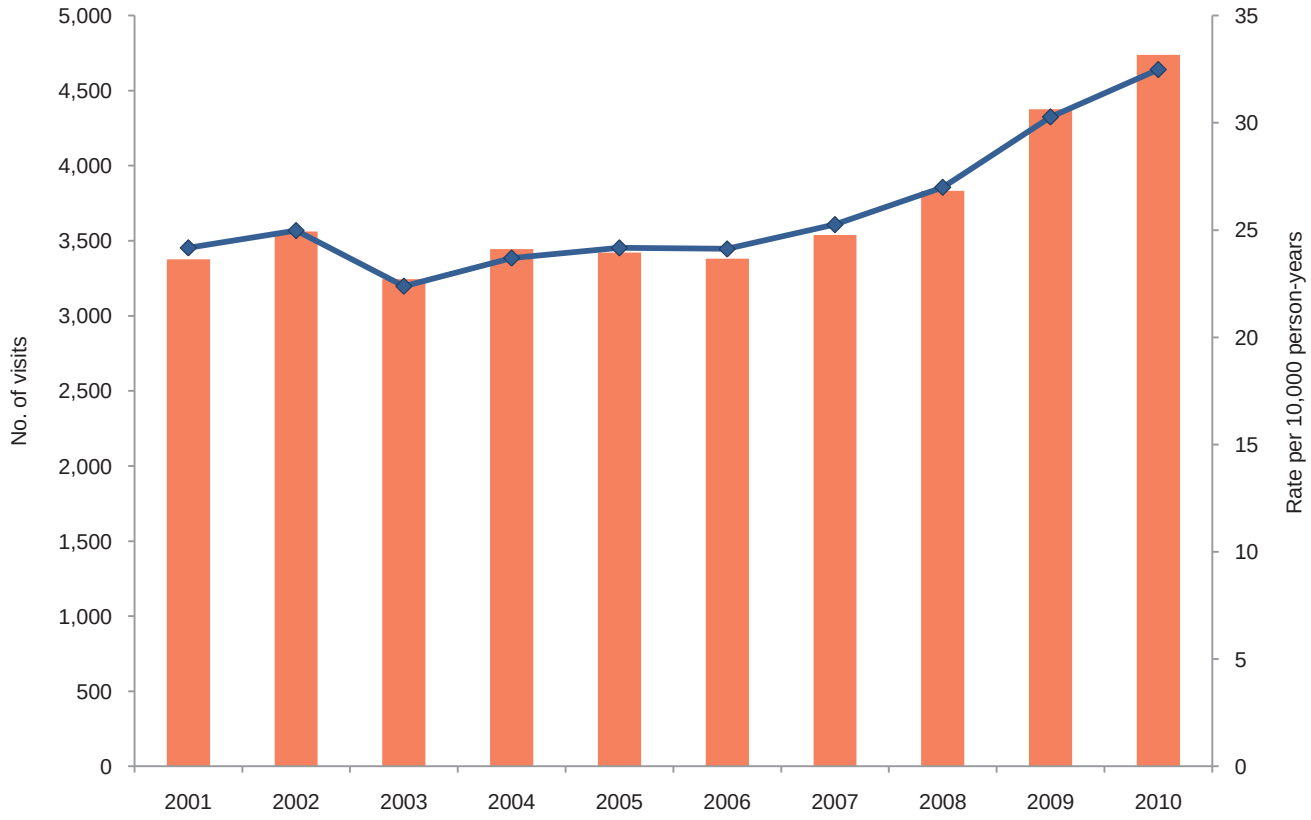
Surveillance Snapshot: Emergency Department Visits for Traumatic Brain Injury

Traumatic brain injury (TBI) is damage to the brain, with disruption of normal brain function that is caused by a sudden external force. Surveillance of TBIs among U.S. military members is conducted by monitoring numbers and rates of TBI-related diagnoses that are routinely reported on records of medical encounters of military members in U.S. military and civilian (purchased care) hospitals and ambulatory clinics. Diagnoses that are indicative of TBI include skull fracture, cerebral laceration, concussion, unspecified head injury, and others.

From 2001 to 2007 among members of the active component, there was little variation from year to year in numbers of emergency department visits that were documented with records that included TBI-related diagnoses (Figure). However, emergency department visits related to TBIs markedly increased each year from 2008 to 2010. Annual rates (unadjusted) of TBI-related emergency department visits were approximately 24 per 10,000 person-years (p-yrs) from 2001 to 2007 and 27-33 per 10,000 p-yrs from 2008 to 2010 (Figure).

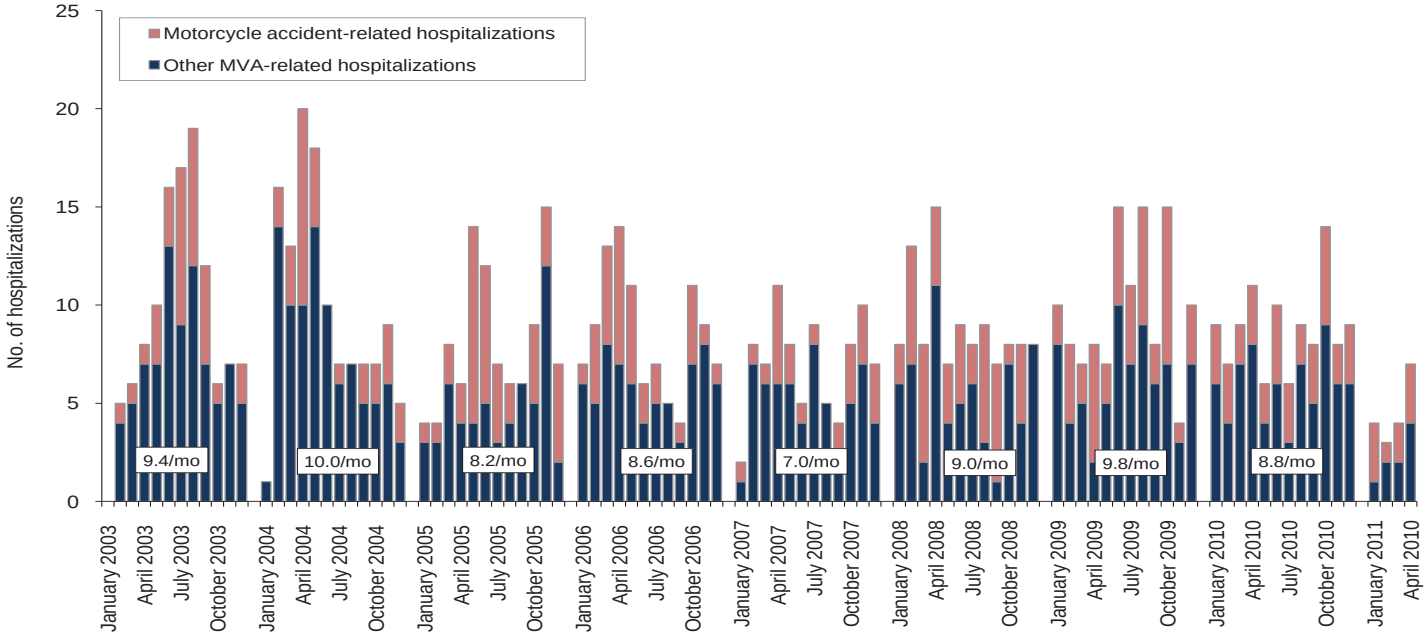
The results of this surveillance snapshot should be interpreted with consideration of the effects of changes since 2001 in TBI-related diagnostic procedures and guidelines, diagnostic coding practices, and awareness and concern among service members, commanders and supervisors, family members, and primary care and other health care providers. The increases in numbers and rates of TBI-related emergency department visits since 2007 may reflect at least in part such recent changes. Finally, these results do not include emergency care provided in deployed settings.

Traumatic brain injury-related emergency department visits, active component, US Armed Forces, 2001-2010



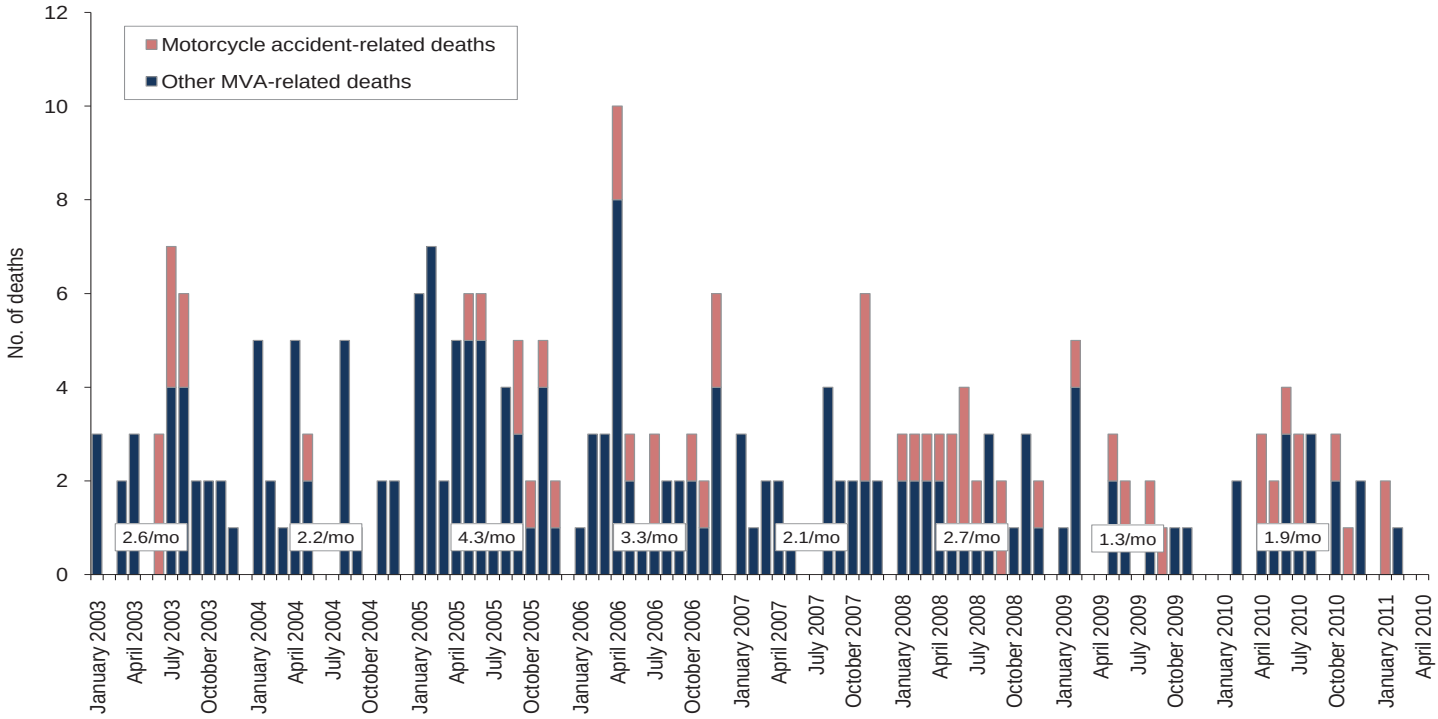
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - April 2011 (data as of 25 May 2011)

Motor vehicle accident-related hospitalizations (outside of the operational theater) (ICD-9-CM: E810-E825; NATO Standard Agreement 2050 (STANAG): 100-106, 107-109, 120-126, 127-129)



Note: Hospitalization (one per individual) while deployed to/within 90 days of returning from OEF/OIF/OND. Excludes accidents involving military-owned/special use motor vehicles. Excludes individuals medically evacuated from CENTCOM and/or hospitalized in Landstuhl, Germany within 10 days of a motor vehicle accident-related hospitalization.

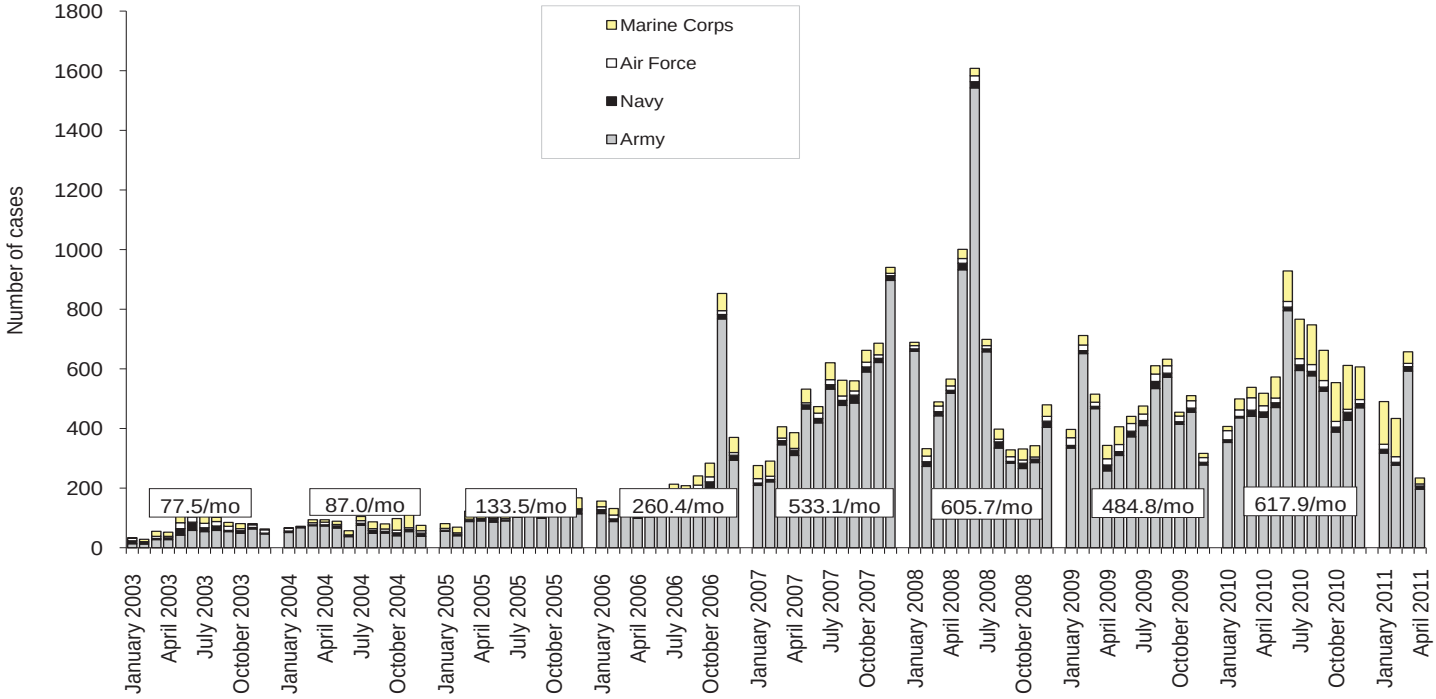
Motor vehicle accident-related deaths (outside of the operational theater) (per the DoD Medical Mortality Registry)



Reference: Armed Forces Health Surveillance Center. Motor vehicle-related deaths, U.S. Armed Forces, 2010. *Medical Surveillance Monthly Report (MSMR)*. Mar 11;17(3):2-6.
Note: Death while deployed to/within 90 days of returning from OEF/OIF/OND. Excludes accidents involving military-owned/special use motor vehicles. Excludes individuals medically evacuated from CENTCOM and/or hospitalized in Landstuhl, Germany within 10 days prior to death.

Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - April 2011 (data as of 25 May 2011)

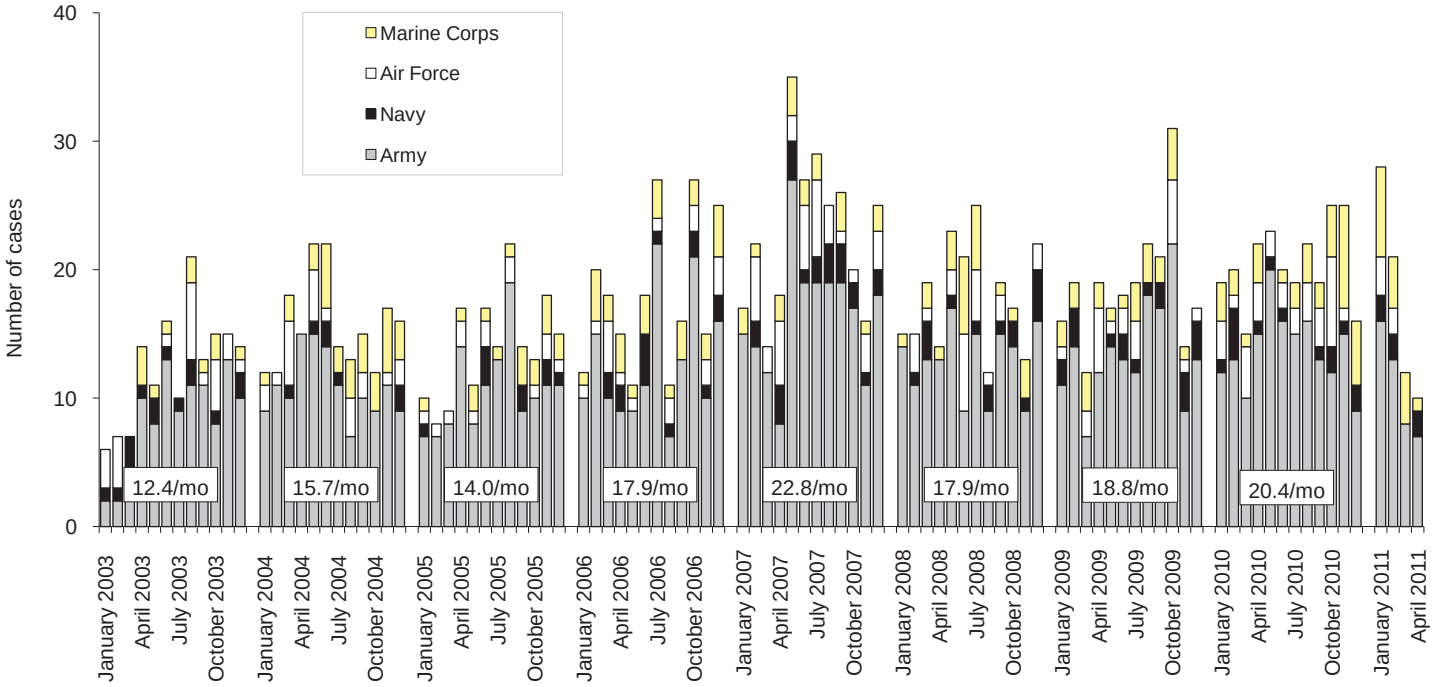
Traumatic brain injury (ICD-9: 310.2, 800-801, 803-804, 850-854, 907.0, 950.1-950.3, 959.01, V15.5_1-9, V15.5_A-F, V15.59_1-9, V15.59_A-F)[a]



Reference: Armed Forces Health Surveillance Center. Deriving case counts from medical encounter data: considerations when interpreting health surveillance reports. *MSMR*. Dec 2009; 16(12):2-8.

[a]Indicator diagnosis (one per individual) during a hospitalization or ambulatory visit while deployed to/within 30 days of returning from OEF/OIF. (Includes in-theater medical encounters from the Theater Medical Data Store [TMDS] and excludes 2,858 deployers who had at least one TBI-related medical encounter any time prior to OEF/OIF).

Deep vein thrombophlebitis/pulmonary embolus (ICD-9: 415.1, 451.1, 451.81, 451.83, 451.89, 453.2, 453.40 - 453.42 and 453.8)[b]

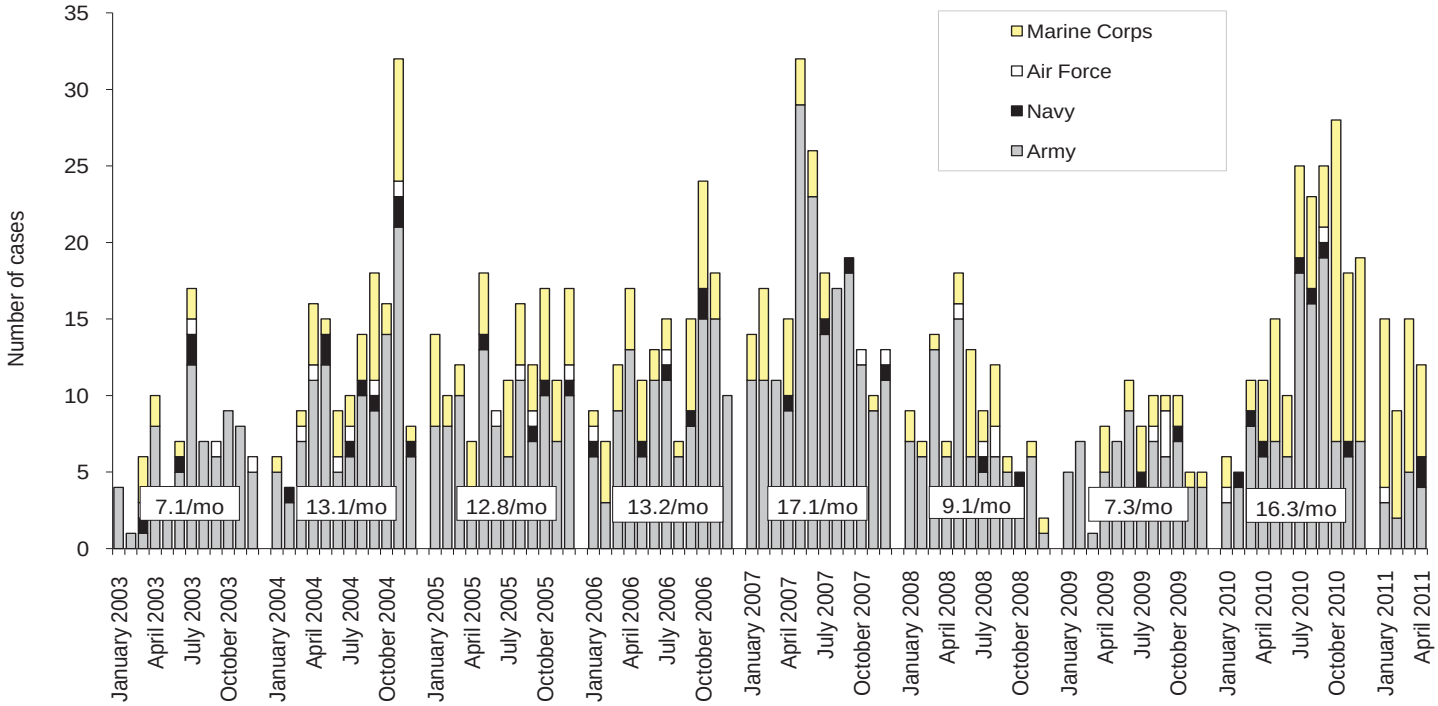


Reference: Isenbarger DW, Atwood JE, Scott PT, et al. Venous thromboembolism among United States soldiers deployed to Southwest Asia. *Thromb Res*. 2006;117(4):379-83.

[b]One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 90 days of returning from OEF/OIF.

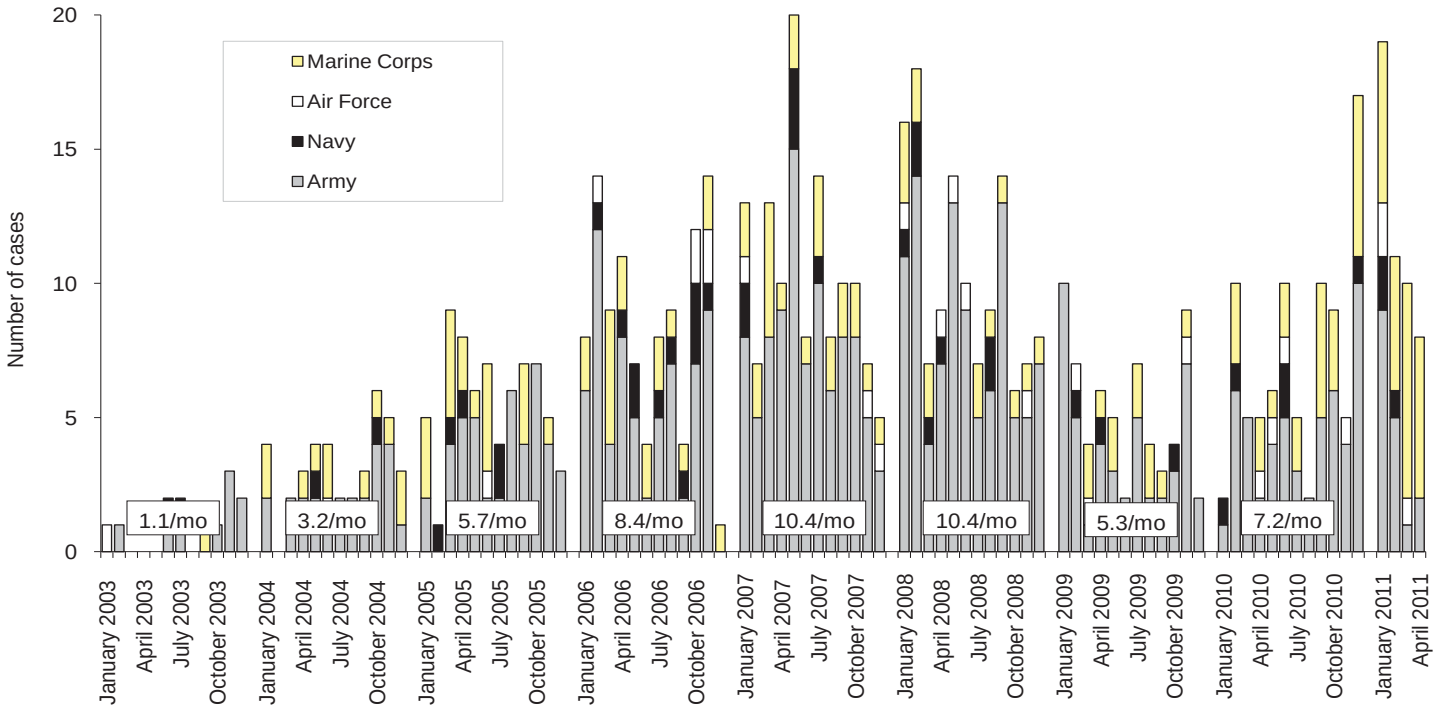
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - April 2011 (data as of 25 May 2011)

Amputations (ICD-9: 887, 896, 897, V49.6 except V49.61-V49.62, V49.7 except V49.71-V49.72, PR 84.0-PR 84.1, except PR 84.01-PR 84.02 and PR 84.11)[a]



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: amputations. Amputations of lower and upper extremities, U.S. Armed Forces, 1990-2004. *MSMR*. Jan 2005;11(1):2-6.
[a]Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 365 days of returning from OEF/OIF.

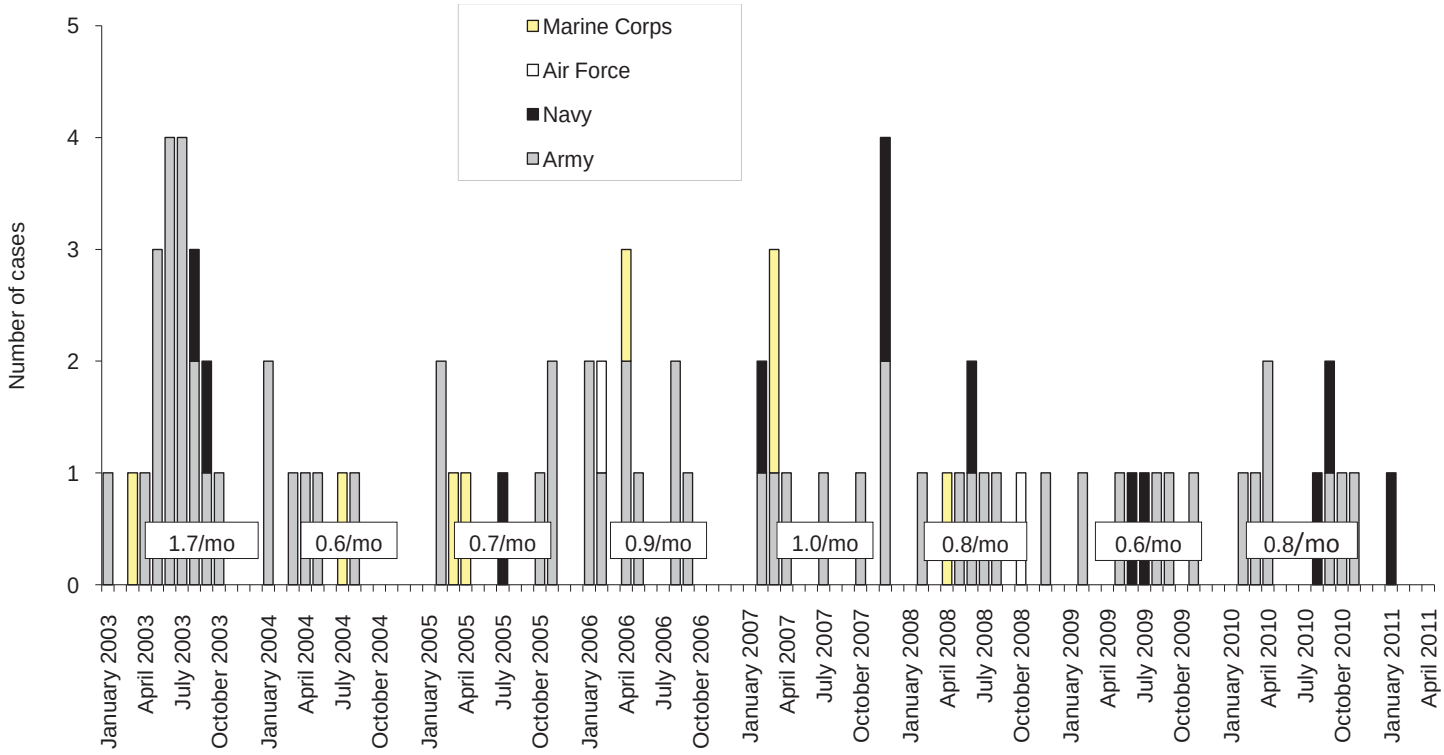
Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)[b]



Reference: Army Medical Surveillance Activity. Heterotopic ossification, active components, U.S. Armed Forces, 2002-2007. *MSMR*. Aug 2007; 14(5):7-9.
[b]One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 365 days of returning from OEF/OIF.

Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - April 2011 (data as of 25 May 2011)

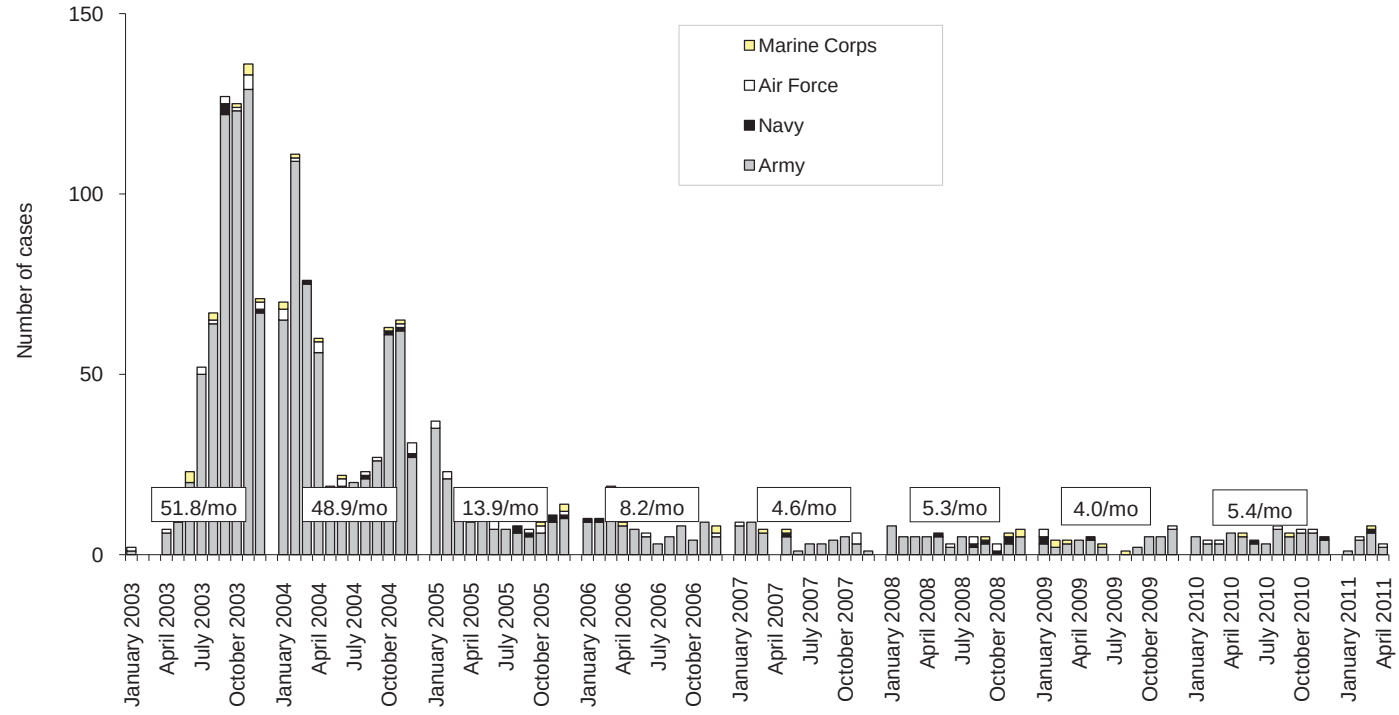
Severe acute pneumonia (ICD-9: 518.81, 518.82, 480-487, 786.09)[a]



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: severe acute pneumonia. Hospitalizations for acute respiratory failure (ARF)/acute respiratory distress syndrome (ARDS) among participants in Operation Enduring Freedom/Operation Iraqi Freedom, active components, U.S. Armed Forces, January 2003-November 2004. *MSMR*. Nov/Dec 2004;10(6):6-7.

[a]Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 30 days of returning from OEF/OIF.

Leishmaniasis (ICD-9: 085.0 to 085.9)[b]



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: leishmaniasis. Leishmaniasis among U.S. Armed Forces, January 2003-November 2004. *MSMR*. Nov/Dec 2004;10(6):2-4.

[b]Indicator diagnosis (one per individual) during a hospitalization, ambulatory visit, and/or from a notifiable medical event during/after service in OEF/OIF.

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ISSN 2158-0111 (print)
ISSN 2152-8217 (online)
Printed on acid-free paper